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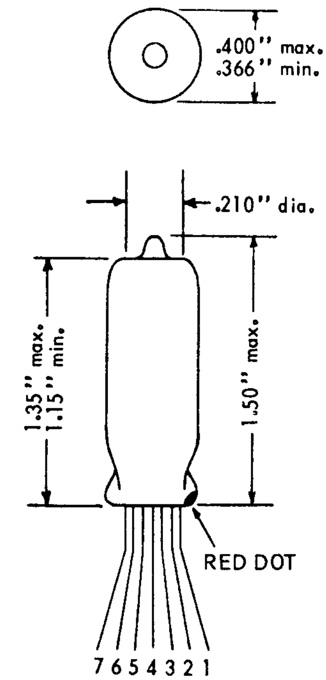


RELIABLE
SUBMINIATURE PENTODE

# TYPE CK7083

*Excellence in Electronics*

The CK7083 (CK631) is a heater-cathode type sharp-cutoff pentode controlled for fast warm-up time and designed to have a high degree of reliability under adverse environmental conditions. It is of subminiature construction capable of operation in the VHF region. This tube is characterized by long life and stable performance. It is designed for service where severe conditions of temperature and vibration are encountered. In addition to the limits and AQL's specified on this data sheet the tubes are subjected to other special quality control sampling procedures. This type has electrical characteristics similar to the type CK5702WA. A separate terminal connection is provided for Grid #3, which under self-bias conditions can be connected directly to ground, permitting the cathode by-pass capacitor to be omitted for lower grid loading. The flexible terminal leads may be soldered or welded directly to circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.




## MECHANICAL DATA

ENVELOPE: T-3 Glass

BASE: None (0.016" tinned flexible leads. Length: 1.5" min.
Spacing: 0.048" center-to-center)

TERMINAL CONNECTIONS: *(Red dot is adjacent to lead 1)*

| | |
|---|---|
| Lead 1 Plate | Lead 5 Grid #3 |
| Lead 2 Grid #2 | Lead 6 Cathode |
| Lead 3 Heater | Lead 7 Grid #1 |
| Lead 4 Heater | |

MECHANICAL RATINGS:

| | |
|---|---|
| Maximum Impact Acceleration (Shock Test – Note 3) | 30 G |
| Maximum Bulb Temperature | 265 °C |

MOUNTING POSITION: Any

## ELECTRICAL DATA

CAUTION-----To electronic equipment design engineers: Special attention should be given to the temperatures at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

| RATINGS AND NORMAL OPERATION: | MIL-E-1 SYMBOL | DESIGN MINIMUM | NORMAL TEST CONDITIONS (Note 5) | NORMAL OPERATION (Note 4) | DESIGN MAXIMUM | MIL-E-1 UNITS |
|---|---|---|---|---|---|---|
| Heater Voltage (Note 6) | Ef: | 5.6 | 6.3 | 6.3 | 7.0 | V |
| Plate Voltage | Eb: | ---- | 120 | 120 | 200 | Vdc |
| Grid #1 Voltage | Ec1: | –55 | 0 | 0 | 0 | Vdc |
| Grid #2 Voltage | Ec2: | ---- | 120 | 120 | 155 | Vdc |
| Grid #3 Voltage | Ec3: | ---- | 0 | 0 | 0 | Vdc |
| Plate Dissipation | Pp: | ---- | ---- | 0.9 | 1.85 | W |
| Grid #2 Dissipation | Pg2: | ---- | ---- | 0.3 | 0.55 | W |
| Grid #1 Circuit Resistance | Rg1: | ---- | ---- | 1.0 | 1.2 | Meg. |
| Heater-Cathode Voltage | Ehk: | –200 | ---- | 100 | +200 | Vdc |
| Cathode Current | Ik: | 0.5 | ---- | ---- | 20 | mAdc |
| Cathode Resistance | Rk: | ---- | 200 | 200 | ---- | ohms |
| Plate Current | Ib: | ---- | ---- | 7.5 | ---- | mAdc |
| Grid #2 Current | Ic2: | ---- | ---- | 2.6 | ---- | mAdc |

Tentative Data

## ELECTRICAL DATA (cont'd)

| RATINGS AND NORMAL OPERATION: | MIL-E-1 SYMBOL | DESIGN MINIMUM | NORMAL TEST CONDITIONS (Note 5) | NORMAL OPERATION (Note 4) | DESIGN MAXIMUM | MIL-E-1 UNITS |
|---|---|---|---|---|---|---|
| Transconductance (1) | Sm (1): | ---- | ---- | 5000 | ---- | µmhos |
| Plate Resistance | rp: | ---- | ---- | 0.34 | ---- | Meg. |

### CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

| TEST | CONDITIONS | AQL % | MIL-E-1 SYMBOL | MIN | BOGIE | MAX | MIL-E-1 UNITS |
|---|---|---|---|---|---|---|---|
| **MEASUREMENTS ACCEPTANCE TESTS PART 1** | | | | | | | |
| Heater Current: | | 0.65 | If: | 183 | 200 | 217 | mA |
| Heater – Cathode Leakage: | Ehk=+100 Vdc | 0.65 | Ihk: | ---- | ---- | 7 | µAdc |
| | Ehk=–100 Vdc | | Ihk: | ---- | ---- | 7 | µAdc |
| Grid Current (1): | | 0.65 | Ic1 (1): | ---- | ---- | –0.1 | µAdc |
| Plate Current (1): | | 0.65 | Ib (1): | 5.5 | 7.5 | 9.5 | mAdc |
| Transconductance (1): | | 0.65 | Sm (1): | 4200 | 5000 | 5800 | µmhos |
| Continuity and Shorts (Inoperatives): | | 0.25 | ---- | ---- | ---- | ---- | ---- |
| Mechanical: | Envelope (8–7) (Note 8) | | | | | | |
| **MEASUREMENTS ACCEPTANCE TEST PART 2** | | | | | | | |
| Insulation of Electrodes: | Ef=6.3 V; Eg–all=–100 Vdc; Ep–all=–300 Vdc | 2.5 | Rg1–all: | 100 | ---- | ---- | Meg. |
| | | | Rp–all: | 100 | ---- | ---- | Meg. |
| Transconductance (2): | Ef=5.6 V (Note 7) | 2.5 | $\Delta_{Ef}$ Sm (2): | ---- | ---- | 15 | % |
| Warm Up Time: | (Note 9) | 2.5 | t: | ---- | ---- | 11 | sec. |
| Plate Current (2): | Ec1/Ib=50 µAdc | 1.0 | Ec1: | –5.0 | ---- | –9.0 | Vdc |
| Screen Grid Current: | | 2.5 | Ic2: | 1.7 | 2.6 | 3.5 | mAdc |
| Plate Resistance: | | 4.0 | rp: | 0.15 | ---- | ---- | Meg. |
| Capacitance: | (Note 2) | 4.0 | Cgp: | ---- | ---- | 0.03 | µµf |
| Capacitance: | | | Cin: | 4.5 | ---- | 5.6 | µµf |
| Capacitance: | | | Cout: | 3.25 | ---- | 4.25 | µµf |
| Temperature Cycles: | T=–62°C to+100°C; (Note 11) | 6.5 | ---- | ---- | ---- | ---- | ---- |
| **DEGRADATION RATE ACCEPTANCE TESTS** | | | | | | | |
| Vibration (1): | F variable 10–75–10 cps; G max=10; fixed amplitude; Rp=10,000 ohms; t=30 minutes (Note 10) | 6.5 | Ep: | ---- | ---- | 50 | mVac |
| Vibration (2): | F variable 75–500–75 cps; G=10; Rp=10,000 ohms; t=30 minutes. (Note 10) | | Ep: | ---- | ---- | 70 | mVac |
| Subminiature Lead Fatigue: | | 4.0 | ---- | 4.0 | ---- | ---- | arcs |
| Shock: | Ehk=+100 Vdc; Rg=0.1 Meg. G=30; t=11 milliseconds duration. Note 3 | 6.5 | ---- | ---- | ---- | ---- | ---- |
| Post Shock and Vibration Test End Points: | | | | | | | |
| Heater – Cathode Leakage: | Ehk=+100 Vdc | ---- | Ihk: | ---- | ---- | 15 | µAdc |
| | Ehk=–100 Vdc | ---- | Ihk: | ---- | ---- | 15 | µAdc |
| Change in Transconductance (1) of individual tubes: | | ---- | $\Delta_t$ Sm (1): | ---- | ---- | 20 | % |
| Glass Strain (Thermal Shock): | | 6.5 | ---- | ---- | ---- | ---- | ---- |

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RELIABLE SUBMINIATURE PENTODE

## ELECTRICAL DATA (Cont'd)

### CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

| TEST | CONDITIONS | MIL-E-1 SYMBOL | MIN | MAX | MIL-E-1 UNITS |
|---|---|---|---|---|---|
| **ACCEPTANCE LIFE TESTS** | | | | | |
| Intermittent Life Test: | TA=room; Ehk=+200 Vdc; Rg=1.0 Meg.; (Note 12). | t | 200 | ---- | hours |
| Intermittent Life Test End Points: | | ---- | ---- | ---- | ---- |
| Change in Transconductance (1) of individual tubes: | | $\Delta_t$Sm(1): | ---- | 20 | % |
| Heater Current: | | If: | 183 | 217 | mA |
| Heater-Cathode Leakage: | Ehk=+100 Vdc | Ihk: | ---- | 10 | µAdc |
| | Ehk=-100 Vdc | Ihk: | ---- | 10 | µAdc |
| Transconductance (1): | | Gm(1): | 3250 | ---- | µmhos |
| Grid Current: | | Ic1: | ---- | -0.3 | µAdc |
| Insulation of Electrodes: | | Rg1-all: | 10 | ---- | Meg. |
| | | Rp-all: | 10 | ---- | Meg. |

NOTES:

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes" and MIL-STD-105A.

Note 2: With a cylindrical shield (0.405" I.D.-1 7/8" long) connected to lead 6.

Note 3: The tube is subjected to 18 impacts of 30 G each, of this total, three shock impulses shall be applied in each of 3 mutually perpendicular axes. There shall be no shorts during shock test.

Note 4: These normal values represent conditions at which control of reliability may be expected.

Note 5: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 6: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

Note 7: Change of transconductance for individual tubes from that value measured at Ef=6.3 V to that value measured at Ef=5.6V.

Note 8: In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet, Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by appendix B of "Inspection Instructions for Electron Tubes."

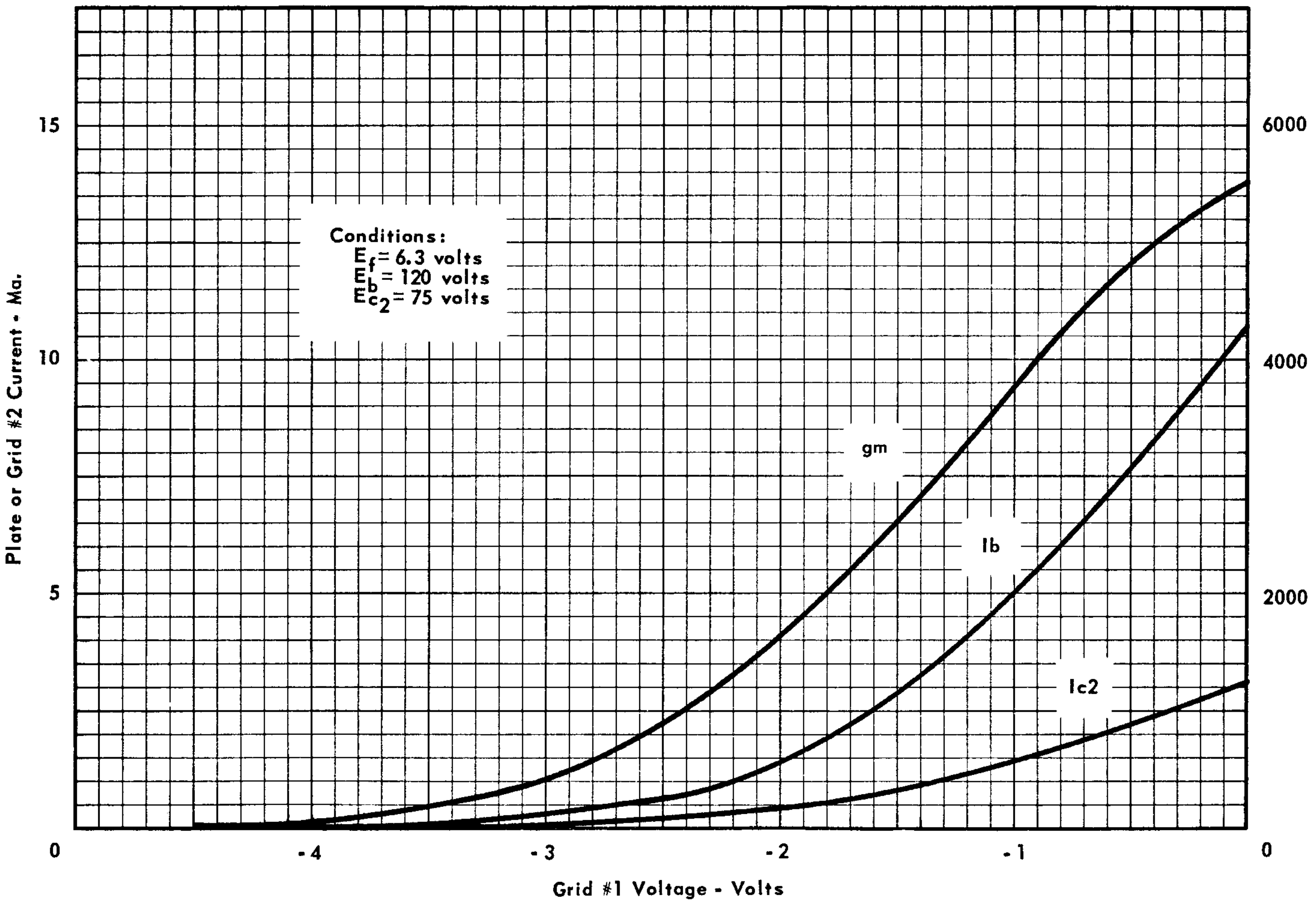
Note 9: Warm-up time is the time in seconds required for the plate current to attain a value within 10 percent of the stabilized plate current measured after 45 seconds of operation. No preheating before this test shall be allowed.

Note 10: The tubes shall be vibrated for 30 minutes in each of three mutually perpendicular planes. The time of a frequency cycle shall be 15 minutes. During the last vibration cycle the noise output shall be measured and the frequency recorded. The tube shall then be vibrated in each of the three planes for 30 minutes at a fixed frequency between 50 and 60 cps for Vibration (1) and 450 and 500 cps for Vibration (2). The same tubes shall be used for both vibration tests.

Note 11: (a) The temperature shall be reduced to -62°C and after the tubes have stabilized for 15 minutes at this temperature, Heater Current, Grid Current and Warm-Up Time shall be recorded.
(b) The tubes shall be operated for 24 hours at an ambient temperature of +100°C under the conditions specified for Intermittent Life Test. Upon the conclusion of this test the tubes shall meet the requirements of Transconductance (2) measured at room temperature.

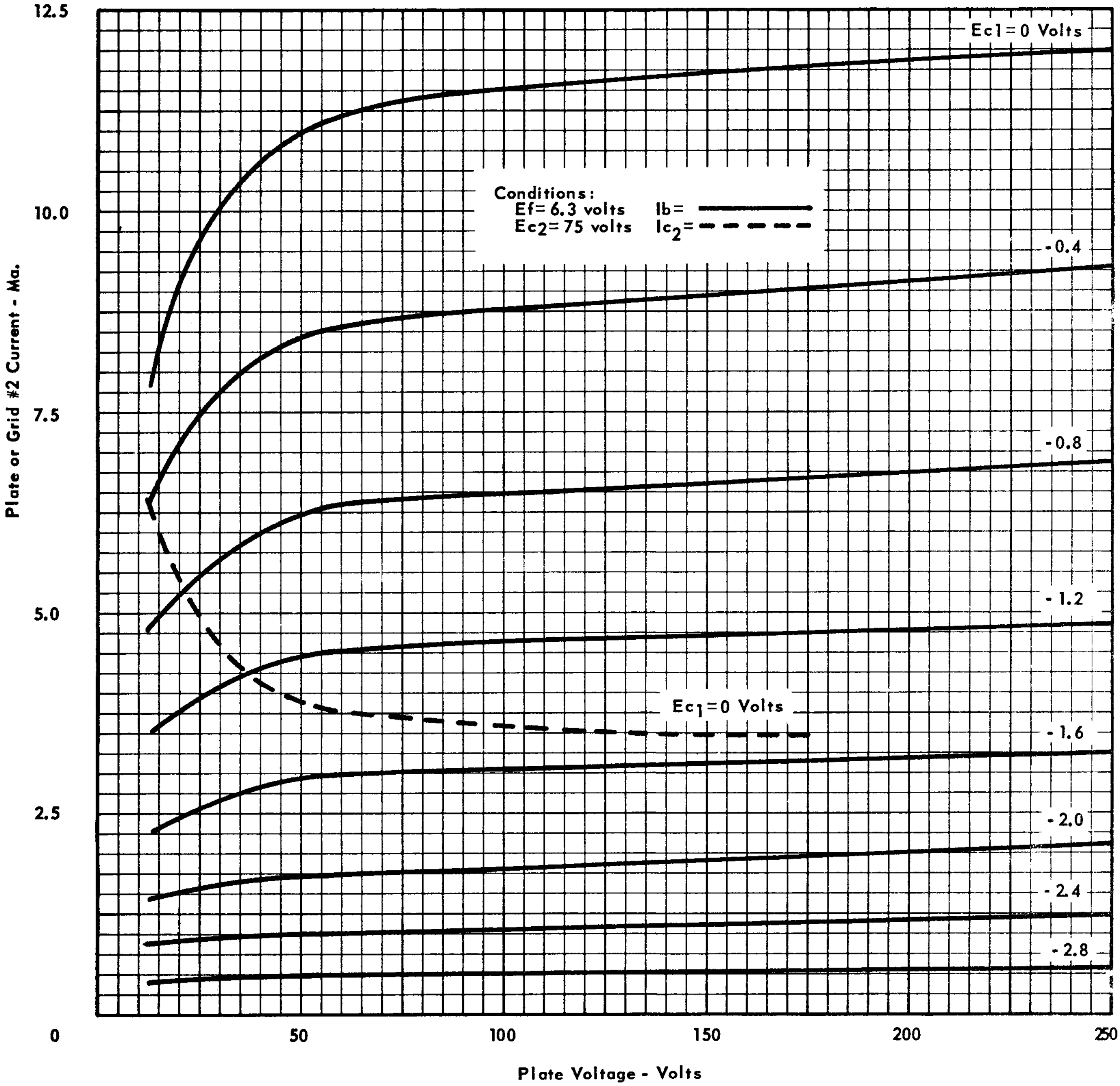
Note 12: The intermittent Life Test shall be cycled 12 minutes "on", 12 minutes "off". Total "on" time shall be 200 hours. The lot shall be rejected if any individual tube becomes inoperative before 100 hours.

AVERAGE CHARACTERISTICS



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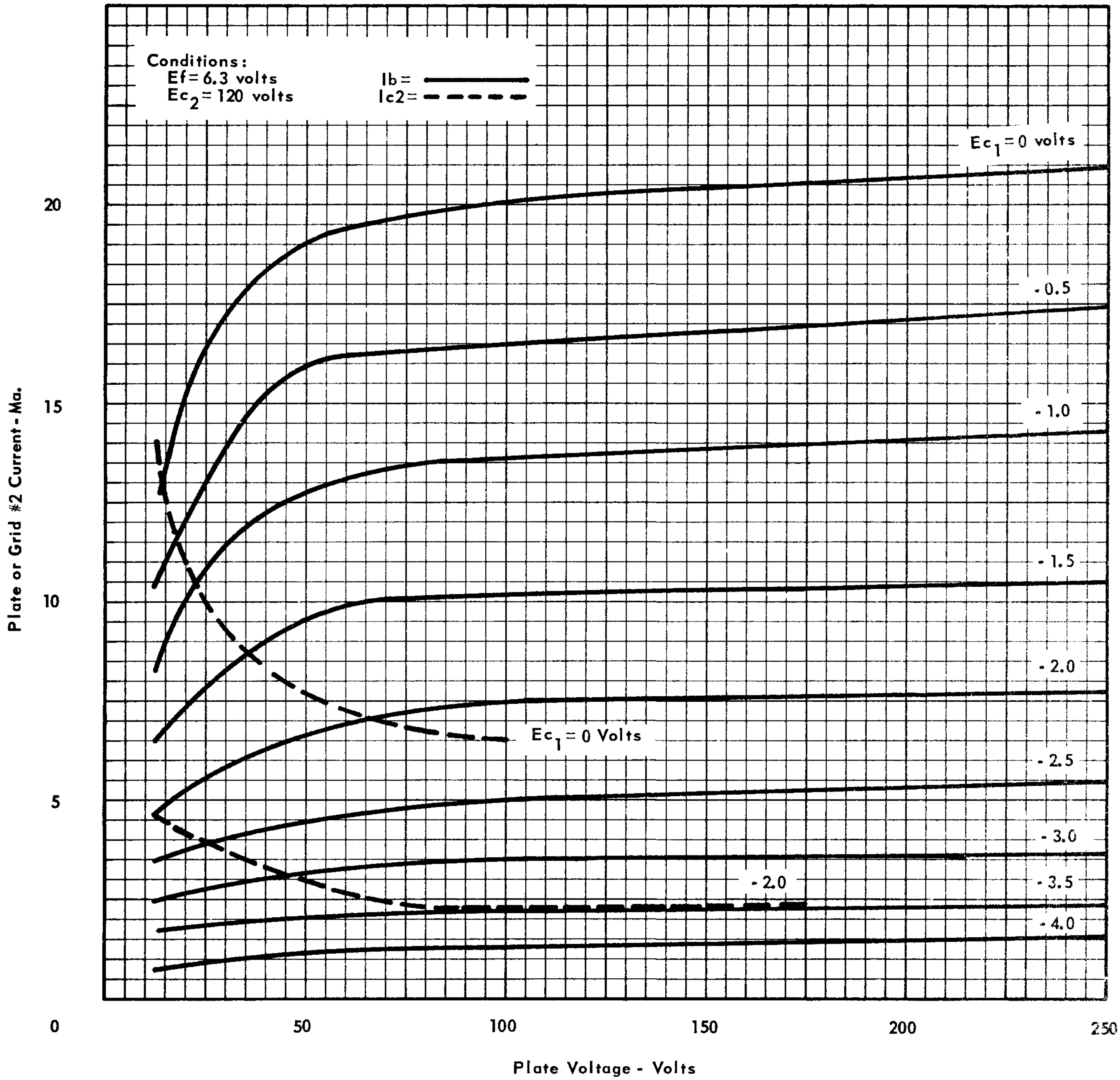
AVERAGE PLATE CHARACTERISTICS



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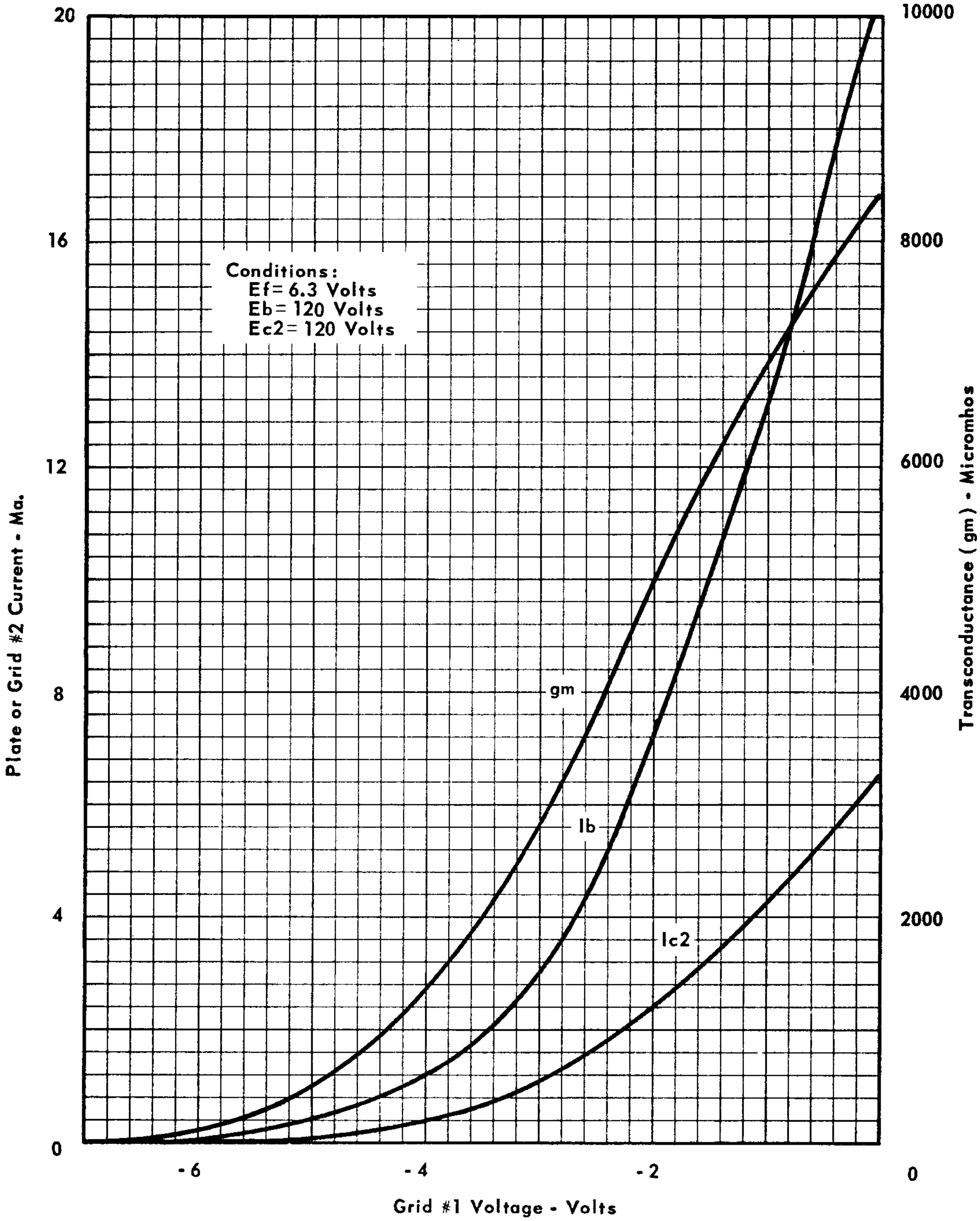
AVERAGE PLATE CHARACTERISTICS



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